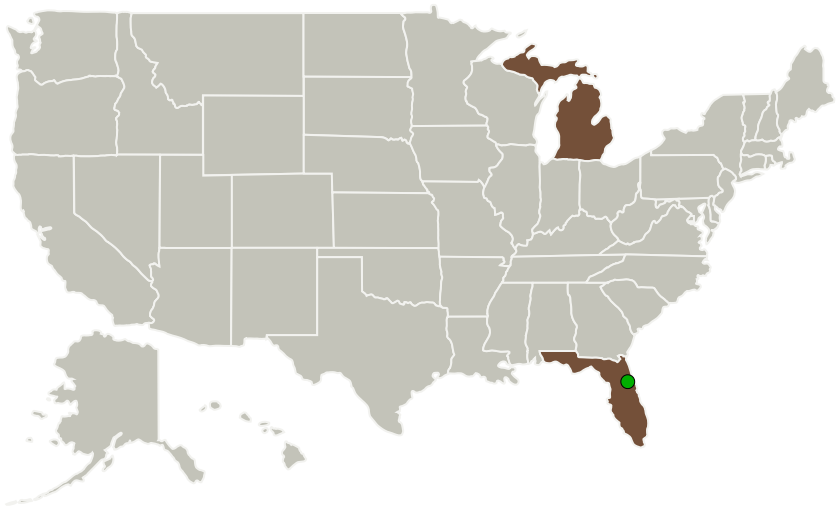
Time-Domain Terahertz Reflection Holograhic Tomography Nondestructive Evaluation System, Phase I

Completed Technology Project (2010 - 2011)

Project Introduction

We propose to demonstrate key elements of feasibility for a single-sided time-domain terahertz reflection holographic tomographic imaging (TD-THz RHT) nondestructive evaluation (NDE) system which will provide high quality three dimensional images of the interior of complex aerospace composite structures. Time-domain terahertz imaging in the 0.1 to 3 THz spectral range is currently being used to characterize defects in Space Shuttle insulation and related materials. The principal imaging technique has utilized 2D raster scanning of a THz transmitter and receiver to generate a two-dimensional image from the reflected signal intensity. The proposed STTR will use existing Picometrix THz imaging hardware, but incorporate measurements of the scattered THz fields, enabling full 3D reflection-mode reconstruction of non-metallic materials on a metallic substrate. It will use holographic information consisting of phase and amplitude data collected through a 2D sampling plane. The specific reconstruction algorithm to be developed is a novel model-based reconstruction algorithm. This will algorithm will maximize the 3D reconstruction accuracy for the data available. Various options for image angles and sample geometries will be explored. The final imaging system will incorporate 2D or 3D scanning hardware and multiple angle data collection to maximize 3D image quality in rapid scanning applications.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Picometrix, LLC	Lead Organization	Industry	Ann Arbor, Michigan
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
Florida	Michigan

Project Transitions

January 2010: Project Start

January 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140503)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Picometrix, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

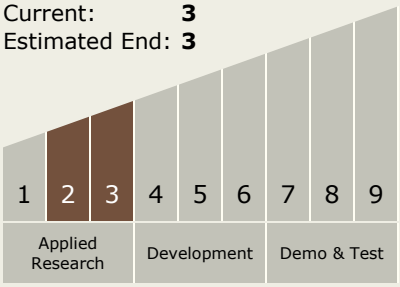
Carlos Torrez

Principal Investigator:

David Zimdars

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.5 Nondestructive Evaluation and Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System